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ABSTRACT

This document summarizes the major studies published on class size and composition for the period 1900-96. It begins by examining the various indices that catalogue research on class size and also looks at those that provide abstracts of published articles, monographs, and government documents. These indices were used to compile a select bibliography with special emphasis on the period 1975-95, which seems to be representative of research as a whole. A content analysis of these documents, along with an ethnographic assessment, yield insights on the principal features of the research, as well as patterns. The study found that questions about class size and composition have been explored since the early 1900s, a time when urban classrooms often accommodated 60 students and one-room rural schools were commonplace. Over the decades the debate over class-size effects has continued, with several positions becoming evident. Some researchers believe that class size neither enhances nor diminishes academic achievement, whereas others have found that relationships do exist between class size and student outcomes. Much of the research focuses on student achievement, with few studies addressing student and teacher attitudes. Unfortunately, less than half of the research on class size and composition is methodologically sound and statistically valid. (Contains 55 references.) (RJM)

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Helen Raptis

2002

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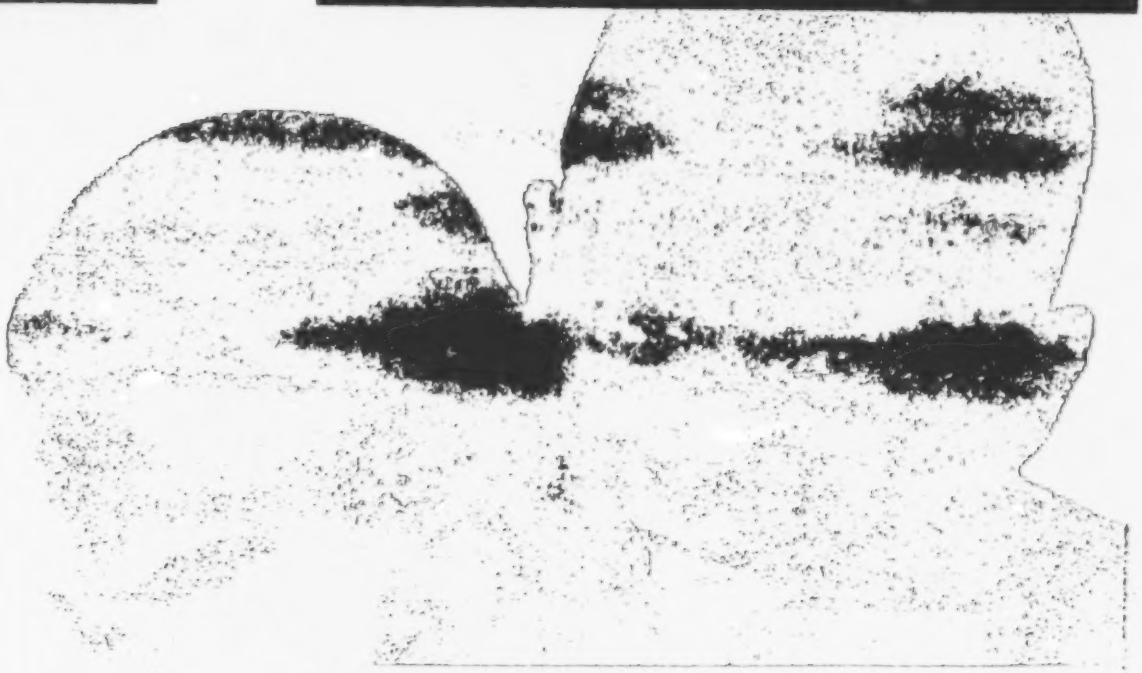

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by
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Introduction

Contemporary educators may derive little solace in learning that Plato, Rousseau, and Horace Mann all wrestled with issues related to optimal "class size" for mass education. In the words of Robert Slavin, a contemporary American class size researcher, "the search for substantial achievement effects of reducing class size is one of the oldest and most frustrating for educational researchers. The search is approaching the end of its first century; eventually, it may rival the search for the Holy Grail in both duration and lack of results" (Slavin 1989, p. 99).

How can educators make sense of the complex literature that chronicles the class size debate? This fastback summarizes the major studies published on class size and composition and on related issues for the period 1900-1996. It attempts to address the question: What does the research tell us about how differences in class size and composition affect students (including achievement and affective outcomes), teachers, and school costs?

The literature on class size, composition, and student achievement is broad, diverse, diffuse, and generally

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unwieldy. As one researcher has described it: "The outcomes of the research effort [into the connection between class size and educational attainments] have been conflicting, inconclusive and disappointingly meager" (Robinson and Wittebols 1986, p. 1). On the topic of "class size" alone, some 1,200 papers have been published over the past two decades. This calculation, of course, represents only two decades of a scholarly record that is at least a century old.

In order to summarize the extensive research, we began by examining the various indices that catalogue research on class size, as well as those that provide abstracts of published articles, monographs, and government documents. These included the Australian Education Index, the British Education Index, the Canadian Education Index, ERIC, the Education Index, and PscyhLit Index. From these indices we compiled a select bibliography with special emphasis on the period 1975-1995, which we believe to be generally representative of the larger literature. Using this select bibliography as a base, we collected an assortment of documents that appeared to be of special relevance.

We then undertook a content analysis of these documents. We tried to be conscious of the historical context in which these writings were produced and to see if patterns in the literature exist over time. Using ethnographic tools, we also tried to define the principal features of the research, including how its emphases have shifted over the past few decades.

Historical Perspectives

Questions about class size and composition have been explored since the early 1900s, a time when urban classrooms often accommodated 60 students and one-room rural schools commonly featured a teacher responsible for instructing 10 to 30 youngsters distributed across six or eight grades (Cuban 1993). Two of the earliest investigations of class size were conducted by Rice in 1902 and Elliot in 1914. Rice examined arithmetic scores in relation to class size and calculated that elementary classes of up to 50 students remained "efficient" and that there were no differences in achievement attributable to class sizes. Elliot examined variations in achievement and class size among fifth- and seventh-grade students in New York and reported that no relationship existed between class size and rates of promotion.

Similar questions were examined over the next half century. In 1925 Averill and Mueller observed that children's reading skills in small classes of 12 increased over those in regular classes (Hollingsworth 1992). In 1934 Dawe reported that kindergarten class size was unimportant in children's ability to retain stories, but he noted that children in small classes have greater opportuni-

ties to participate in discussion than do those in larger classes (Hollingsworth 1992). Such research increased after World War II. In 1954, for example, Otto examined 50 small and 50 large elementary school classes and concluded that, though the class atmosphere was better in the small classes, no differences in pupil achievement could be found (Hollingsworth 1992).

In the mid-1960s class size suddenly emerged as an explosive education and public policy question with the publication of a study led by Coleman, *Equality of Educational Opportunity* (Coleman et al. 1966). What became known as "the Coleman Report" was the summary of a study that had tested about 600,000 students in some 3,000 schools. This report garnered enormous public interest by concluding that schools were not fundamentally important in determining student achievement and that primary influences on student performance were more attributable to families and, to a lesser extent, student peer groups (Hanushek 1989).

Various efforts have been made to classify this literature. In 1978, Hess divided the literature into three basic groups — research that focuses on student achievement (the largest part), research on institutional factors, and research on the financial implications of reducing class size. In 1986, Robinson and Wittebols attempted to summarize the contents of 100 studies by clustering them into "18 areas of concern." More recently, Blatchford and Mortimore divided the literature by research design into three broad domains: large-scale correlational studies, research that involves "taking the results from large numbers of research projects and put-

ting them together into one analysis — so-called meta-analysis," and experimental research, which they describe as "the only research that can really give us conclusive answers to the question of whether children in smaller classes do better" (Blatchford and Mortimore 1994).

Blatchford and Mortimore also noted the deep methodological problems that characterize class size research, concluding that "long-running disagreements amongst researchers have in recent years reached a new vehemence" (1994, p. 412). Others concur. Ryan and Greenfield's lengthy 1975 review concluded that class size research generally failed to control what was obviously the most significant variable common to all of the studies — the quality of teaching.

One problem faced by this research has been strong indictments of its validity. Mitchell and his colleagues argued that "class size research has had a history of limited research design, inappropriate methodology, and biased literature reviews; the most seriously misleading conclusions have often been repeated in subsequent analyses; [and] development of a theoretical framework for determining class size influences on learning has been slow" (Mitchell et al. 1989, p. 67). Moreover, they reported: "research motivation, the effects of confounding variables, and problems related to distinguishing between student achievement and other classroom process changes, are largely responsible for the divergent, sometimes conflicting views expressed in the literature" (p. 7).

In 1980, Cotton and Savard reviewed 35 pieces of research for the Alaska School Effectiveness Project and

found only 20 of them to be valid studies. Elsewhere, in commenting on the statistical validity of studies connecting class size and student achievement, Hanushek wrote: "Of the 152 estimates of the effects of class size, only 27 are statistically significant, and only 14 show a significant relationship of the expected positive sign. Thirteen display a statistically significant negative relationship. An additional 125 are not significant at the 5% level. Nor does ignoring statistical significance help to confirm the benefits of small classes, because the insignificant coefficients lack the expected sign by a 46 to 34 margin" (Hanushek 1989, p. 47). In short, considerable unease has been expressed by these and other scholars about the problems found in this research.

Claims and Counter-Claims

The debate on class size and its effects can be categorized into two broad areas: studies that address the effects of class size, or lack thereof, on variables within the cognitive domain and studies that address effects outside the cognitive domain.

Effects on Student Achievement

The class size debate has included a broad spectrum of positions. On one edge of the spectrum is the view represented in Haddad's 1978 review of the literature for the World Bank. In summarizing his review, Haddad wrote that "an increase in class size does not necessarily lead to a decrease in level of academic achievement. Likewise, a decrease in class size does not guarantee an improvement in the social environment of learning. More important is what the teacher does with the opportunities provided by the size of the class. In the absence of a statistically established basis for an optimum class size . . . decisions regarding this issue are bound by fiscal and curriculum policies and conditions" (1978, p. 14).

The World Bank was not the only agency to present this view. The Organisation for Economic Co-operation

and Development, for example, has argued that student achievement is either not related to class size or is higher with larger classes (OECD 1974). Smith's analysis of 34 studies, part of a report originally prepared for the Committee on Research for the National Council of Teachers of English, argued that "for the most part the findings show that large classes versus small classes have little or no effect in student performance" (Smith 1971, p. i). Publication in 1978 of a major review of 41 studies on class size and achievement by the Educational Research Service also seemed to confirm that reducing class size alone would not increase pupil performance (Porwoll 1978).

Since that time, this position also has been advanced by Hanushek in a meta-analysis of 187 studies of production and expenditure relationships in schools (Hanushek 1989). In his paper, Hanushek claimed, "The results are startlingly consistent in finding no strong evidence that teacher-student ratios, teacher education, or teacher experience have the expected positive effects on student achievement" (1989, p. 47). Hanushek supported this assertion more recently by pointing out, "the teacher pupil ratio fell from one teacher to 26 students in 1960 to one teacher to 17 students in 1990, [and] during the same period, the percentage of teachers with a master's degree more than doubled from 23% to 56% . . . [but] reading achievement is essentially the same in the 1990s as it was in the early 1970s; science achievement has fallen; and math achievement is only slightly improved" (Hanushek 1995, p. 61).

A study of 62 fourth- and fifth-grade classes in 11 Toronto schools found a similar lack of effects (Shapson

et al. 1978). This study investigated the effects of class size on teachers' expectations about the effects of specific class sizes; students' attitudes and opinions; student achievement in reading, mathematics, composition, and art; students' self-concepts; and other classroom variables. Shapson and his colleagues concluded that, though teachers believed that reducing class size is beneficial, variations in class size in these two grades resulted in few changes in classroom functioning or in student achievement, except in acquisition of mathematics concepts (Shapson et al. 1978). It appeared from their research that reducing class size means little if teachers continue to use the same instructional methods used in larger groupings and if teachers do not capitalize on the opportunity to individualize instruction (Gilman et al. 1988). Since this time, Hallinan and Sorensen (1985) have similarly reported that classroom pedagogical practices mediate the effect of class size on learning.

Three other studies are of note. Harder's 1990 article suggests that quality of instruction may be more important than class size in determining student achievement. Stern's 1987 paper implied more strongly that student achievement was linked to where teachers were placed on local salary schedules and that raising teachers' salaries would be more cost-effective than reducing class size. McIntyre and Scott echoed this contention when they argued that "Overall findings do not support the cost associated with universal class size reduction and indicate that smaller investments in other educational strategies may yield similar or greater achievement

gains." Rather than establishing an absolute class size policy, they advised that class sizes should be lowered in subjects that require greater teacher-pupil interaction and that have high workloads (McIntyre and Scott 1989).

Not all researchers have concluded that class size has no effect. A number of researchers have argued that some relationships do exist between class size and student outcomes, and others argue that the evidence still is inconclusive.

In his review of data from Tennessee's Project Star and other research on class size and student achievement, Tomlinson, for example, maintained that findings provided "no support for the idea that 12 years of small classes would produce significant increase in student achievement" (Tomlinson 1990, p. 18). Nevertheless, he allowed that disadvantaged minority students seemed to benefit significantly from small classes. Berlin and Cienkus (1989) have likewise observed that "the need for smaller class size is inversely proportional to student's socioeconomic status." In addition, Hallinan and Sorensen have pointed out that, while class size seems to have a negative effect when instruction is delivered in whole-class and ability group settings, "when student race is controlled, the class-size effect disappears" (1985, p. 71).

Similarly moderate associations between class size and achievement have been reported by others. For example, Anderson and Walberg (1972) concluded that indicators of the social environment of learning were quite sensitive

to variations in class size in the physics classes they studied. Slavin (1990) also suggested that reduced class size may change school tone and morale positively, though he concluded that reducing class size should not be regarded as a stand-alone policy for improving student achievement.

Thompson noted the generally inconclusive nature of class size research when he reported:

> While the desirability of small classes seems an 'article of faith' among educators, a review of the research indicates that class size in itself has rarely shown a substantial effect on educational achievement. The research itself has been flawed by the impossibility of determining or measuring all the variables that changes in class size can affect. It may also be true that the positive effects attributed to smaller classes are not translatable into testable outcomes. In the end, educational goals, instructional strategies, and related contextual matters may be most important in determining optimum class size. (Thompson 1978, p. i)

At the other side of the spectrum is the body of literature dating from the late 1970s that argues the existence of a relationship between class size and students' academic performance. One of the first major studies to make this assertion vigorously was Glass and Smith's 1978 article, based on a meta-analysis of 77 studies dating to the turn of the century from a dozen countries. Glass and Smith showed that 60% of the comparisons for elementary and secondary students favored small classes; and they asserted, without qualification, that "reduced class size can be expected to produce in-

creased academic achievement" (1978, p. iv). Glass and Smith's methodology and conclusions met with considerable criticism, as well as strong counter-arguments offered by the Educational Research Service in 1980.

The class size-student achievement connection made by Glass and Smith and, later, by Glass was supported in the 1980s by reports of two major longitudinal studies, Indiana's Prime Time and Tennessee's Project STAR (Student-Teacher Achievement Ratio) (Glass 1980). In 1984-1985, Indiana reduced class sizes in all first-grade classes to a pupil-teacher ratio of 20:1, following a pilot program that had reduced class size in 24 kindergarten to second-grade classes to a pupil-teacher ratio of 14:1. Several studies examined the effects of reduced class size. One compared pupils' achievement in small first-grade classes (18 pupils) to their achievement in larger classes (22 pupils). According to the final report for this study, the findings provide overwhelming evidence of the gains in scores for students in the 1984-1985 small classes as compared to the larger classes of the 1983-1984 school year (Goettler-Sopko 1990).

Since publication of the Prime Time study, however, McGiverin, Gilman, and Tillitski have sounded a note of caution about interpreting its results. As they put it:

> Further caution is encouraged because research continues to suggest that the relation between class size and achievement is difficult to characterize. For example, a federal study published after our study was conducted has concluded that reductions in class size by themselves are costly, unlikely to result in improvements, and have little effect on student achievement (Tomlinson

> 1988) . . . Perhaps the gains we found were partially attributable to the novelty of the state program, teacher expectations, or the belief of second-grade teachers that failure to produce student gains could result in the potentially negative effect of a return to larger classes. (1989, pp. 54-55)

Tennessee's Project STAR was similar to Indiana's program in its emphasis on reduced class sizes in the early grades. Over a four-year period, the achievements of more than 6,000 students from 75 schools in 42 districts were compared according to three class sizes: small classes (13-17 students), regular classes (22-26 students), and regular classes with a full-time teacher aide (Nye et al. 1993). Researchers reported that students in small classes improved more than students in larger classes, that gains children made in kindergarten were maintained through grade three, and that the presence of a teacher aide could not be correlated with pupil achievement (Nye et al. 1993). Inquiring more closely into the apparent non-effects of teacher aides in this study, Achilles concluded that students who were retained a grade before entering the STAR program benefited most from classes with a teacher aide but that a small class "does not remedy already-defined test-score deficits after students have experienced regular classes." (Achilles 1993, p. i). Harvey (1994) reported a similar finding.

STAR pupils were also made the subject of a follow-up study, the Lasting Benefits Study, which examined their performance through later grades. This study concluded that students who were in small classes were

more advanced statistically and educationally and had higher high school participation measures than did students in regular classes (Harvey 1994).

A number of researchers accept that a positive correlation between class size and achievement exists but argue that it holds only in the first years of schooling. Folger and Breda (1989), for example, suggest that the class size effect is concentrated in kindergarten and first grade and that, after first grade, the effects of reducing class size plateaus and then declines. Robinson and Wittebols (1986) also observed that the effects of smaller classes on student learning tails off as grade levels increase. Slavin and his colleagues (1991, p. i) concluded that programs to reduce class size in early schooling are "the only programs known to have lasting effects, at least through the third grade."

Finally, a number of researchers argue that there may be a positive correlation between reduced class size and student achievement for some grades, but such a policy would cost too much. For example, Robinson and Wittebols (1986) noted that a policy of reducing class size might appear sensible, but it would have far-reaching financial consequences. Mitchell and Beach argued that, though class size has a "substantial and cumulative effect on student learning . . . responding to this evidence is difficult because the cost of class size reduction is enormous. It is impossible to imagine public support for the level of funding needed to substantially reduce class size through expansion of school facilities and staff" (1990, p. 4).

Folger and Breda note that "reducing class size substantially is very costly . . . [and] that across-the-board class size reduction is an expensive way to make a modest improvement in student achievement." They point out, in relation to Project STAR, "that when class size is reduced by a third, operating costs, mostly for additional teachers' salaries, will rise 24%-28% annually and capital costs for extra classrooms, amortized over 30 years, will add another 5%-7% to costs annually" (1989, p. 17).

In a policy paper for the U.S. government, Tomlinson (1988) argued that the costs of class size reductions outweigh the benefits and, moreover, that reducing class size to improve student achievement is at variance with other policies to enhance teacher professionalism and to place greater responsibility on teachers.

Other Effects

Few authors deal with the effects of reducing class size other than those on student achievement. While there is a wealth of research related to the effect of class size on student achievement, there is considerably less on student and teacher attitudes and teacher workload or stress. These tend to be linked within the literature.

Several publications reflect the broader discourse that challenges the use of achievement tests as measurement tools and, in particular, the use of such tests to describe the range of outcomes associated with student learning and the quality of life within classrooms. The National Education Association's position on class size and achievement stresses other factors.

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> Studies that conclude that class size makes no difference are based almost entirely on student achievement of cognitive scores, whereas those studies that find class size significant include other important factors such as creativity, decline of learning and behavior problems, better class control, problem-solving and retention, and the amount of opportunity for each child to participate and express himself orally. (NEA 1974, p. 2)

A similar position is found in a literature review by the South Carolina Department of Education. Acknowledging that "much of the research on class size is methodologically weak and should be evaluated in its own right before its results are accepted," this review concludes:

> studies revealing no effect on achievement due to class size are based almost entirely on measures of cognitive learning, while those that find class size significant measure other areas of growth as well, such as mental health, problem solving skills, and aesthetic, personal, and creative development. For the most part, class size is only one variable among a number of important variables affecting learning. These include student and teacher characteristics, the instructional program and its goals, the subject matter being taught, the reasons for altering class size, and economic factors. (South Carolina State Department of Education 1980, p. i)

Blatchford and Mortimore observed serious dangers in the ways that data on classroom processes are gathered and collated:

> For one thing they take no account of context: the different ages and abilities of pupils, their school catch-

> ment characteristics and cultural backgrounds, and a host of other characteristics may all influence effects of different-sized classes. [There is also] need to consider effects in relation to class size reductions of different degrees of magnitude. Moreover, as we have seen, the quality of research itself varies, and it is very difficult to conclude which factors are most important, and which of the associations just listed are most reliable. (1994, p. 425)

Inside classrooms, where researchers have concentrated their attention for the past 20 years, there appears to be an obvious dearth of more carefully elaborated studies that consider, as one researcher has written, "important mediating variables such as intra-classroom organization, curricular objectives, and teaching styles" (Folger 1989, p. 131).

Reductions in class size may improve mainstreaming special needs students in the regular classroom, can lessen teacher workloads in the initial years of teaching, and can reduce the amount of time English teachers require for planning and marking.

English teachers' associations have lobbied for smaller class sizes because of the additional workload associated with evaluating compositions. For example, a survey of California English teachers found that large class sizes were most frequently identified by teachers as detrimental to teaching composition and recommended limiting enrollment in composition classes to resolve the problem (Bamberg 1977). The major conclusion of the California survey was that the total student loads of most full-time teachers of English must

be substantially reduced if composition is to receive the attention demanded by the public.

A decade later, in a 1987 position paper for the NCTE / SLATE Steering Committee on Social and Political Concerns, Maxwell wrote that unsatisfactory conditions for teaching writing likely explained why little progress has been made in the improvement of students' writing, as reported by the National Assessment of Educational Progress. Maxwell maintained that the research shows a need for radical reduction in class size and radically different methods of instruction. Despite Maxwell's assertion, William Smith (1986), also writing for the NCTE, acknowledged the contradictory findings on class size in English and called for more research.

In 1984, Ferguson investigated the factors that caused stress for 406 teachers in Nova Scotia. In addition to such factors as paperwork and lack of administrative support, Ferguson found that the size of classes was frequently considered "very stressful" and among the most often stated changes teachers would like to make in their jobs (Smith 1986). Similarly, in describing his findings from two surveys of beginning teachers, Ayalon (1989) concluded that adequate planning time and reduced class size may reduce beginning teachers' burnout and attrition. However, in a survey of 447 special education teachers, McIntyre (1983) argued that there was no significant correlation between the amount of daily student load and any of six aspects of burnout, as measured by the Maslach Burnout Inventory.

Only recently have studies begun to consider the effect of class size on how teachers' teach. One recent survey of kindergarten teachers in New Zealand found

that changes in class size had several effects on teachers and the way they dealt with students. Although the adult-student ratio remained at 1:15, teachers' noted that in larger classes they had less time to work with individual children and small groups (Renwick and McCauley 1995). Similarly, in a study of overcrowding in urban schools, Burnett (1995) found that crowded classroom conditions not only affected students' ability to concentrate on their lessons, but also limited the amount of time teachers could spend organizing students for cooperative learning and group work or teaching anything beyond what was minimally required. Burnett suggests that because they must constantly struggle to maintain order in an overcrowded classroom, the likelihood increases that teachers will suffer from burnout earlier than they might otherwise.

The effects of class size are intertwined with other factors in schools. Logan-Woods (1989) has noted the importance of connecting findings on class size with research findings on effective schools, effective teaching, and mastery learning. She cautions that policies on class size should be matched to student needs. Robinson (1990) has observed that, because smaller classes do not necessarily produce improved student achievement, emphasis should be directed toward understanding the effects of class size on student learning by grade, pupil characteristics, subject area, and teaching method.

Conclusion

The research on the effects of class size is contradictory and filled with problems. Less than 50%, maybe even fewer than 25%, of the research is methodologically sound and statistically valid (Cotton and Savard 1980). However, some general conclusions can be reached.

The effects of class size on student achievement become smaller as grade level increases. The effects of reduced class size are relatively consistent and positive in terms of student achievement for Grades K-3; but the effects are slight for students in Grades 4-8, and they are "essentially nonexistent" for Grades 9-12 (Robinson 1990). However, even in the grades (K-3) with the most consistent positive effects, only 50% of studies cited in one review found significant differences favoring small classes (Slavin 1989).

Research consistently reports that economically disadvantaged students and students who are members of ethnic minorities perform better academically in smaller classes. But, again, this research is from a fairly limited research base (Robinson 1990).

The literature has yet to address properly the effects of class size on "at risk" students. As Slavin observed

in 1989, "we do not know enough at this point to say that simply reducing class size is going to solve the achievement problems of at-risk students, at least not until class size is reduced to one for some portion of students' school days" (p. 108).

The desirability of smaller classes appears to be an "article of faith" among teachers, other members of the educational community, and some parts of the public. However, teacher behavior varies little with class size (Shapson et al. 1978; Robinson and Wittebols 1986; Blatchford and Mortimore 1994). Where teachers do change their behavior, the changes are "relatively subtle and unlikely to make important differences in student achievement" (Slavin 1989, p. 106).

Manageable class sizes may represent an important psychological factor for teachers. Some studies suggest that because teachers must struggle to simply maintain order in an overcrowded classroom, the likelihood increases that teachers will suffer from burnout earlier than they might otherwise (Schieber 1979). However, a survey of special education teachers found no significant correlation between the amount of daily student load and any of six aspects of burnout (McIntyre 1983).

Some recent studies suggest that group size affects the types of activities that teachers offer students. For example, in a recent survey of kindergarten teachers in New Zealand, teachers noted they had less time to work with individual children and small groups (Renwick and McCauley 1995). A study on overcrowding found that large classes limited the amount of time teachers could spend teaching anything beyond what was minimally required (Burnett 1995).

However, no debate is found in the literature as to whether or not larger classes are more efficient and less expensive than smaller ones (Hess 1978).

For more than 20 years, researchers have generally maintained that reducing class size is a costly undertaking and that the cost of substantial reductions in class size are prohibitive.

The following comment made by Robinson sums up the current state of belief within the research community about what the current state of knowledge could prescribe: "Certainly, class sizes should be within reasonable ranges in which the most effective teaching and learning can occur. But in terms of increased pupil learning, research evidence does not justify an absolute limitation on class size or small overall reductions in class size or pupil teacher ratio as a matter of general policy in isolation from the many other factors involved" (1990, pp. 80-90).

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